

Claims

1. A method for dynamic bandwidth allocation in a Passive Optical Network (PON), said PON includes an OLT and a plurality of ONUs accessing to the OLT, comprising:

a) classifying services which are to be communicated between the OLT and an ONU into a plurality of service types according to different transmitting requirements, and granting a different priority to each type of the services;

b) authorizing a service port of every type of services to transmit service data in descending sequence of said priorities of the services, and recording the granting information of the service ports obtained from the authorization;

c) reading out said granting information of every to-be-granted service port of the same ONU; and

d) scheduling start time of granted data transmission of every to-be-granted service port of current ONU, generating a downlink granting message including both said granting information and said start time of granted data transmission of every granted port of said current ONU, and transmitting said downlink granting messages to said current ONU.

2. The method according to Claim 1, further comprising: generating Active Timeout Counter to count non-response periods of each ONU;

and further comprising a flow of aging ONU information:

A. inquiring status of the ONUs one by one, determining whether the status of current ONU is invalid, if yes, returning to step A; otherwise, proceeding to step B;

B. determining whether MPCP messages have been reported by said current ONU in the present bandwidth allocation polling period, if yes, resetting corresponding Active Timeout Counter of said current ONU, and proceeding to step C; otherwise, proceeding to step C directly;

C. determining whether the value of said Active Timeout Counter of said current ONU exceeds the settled off-line threshold, if yes, setting the status of the current ONU as invalid, releasing corresponding resources of this ONU, proceeding to step D; otherwise, proceeding to step D directly; and

D. determining whether all the ONUs are inquired, if yes, ending the ONU information aging flow of the present bandwidth allocation polling period; otherwise, returning to step A, continuing with the inquiry of a next ONU.

3. The method according to Claim 2, further comprising:

generating an ONU Status Information table indexed by ONUID, which is to store every ONU's status information that is generated according to MPCP messages communication between the ONUs and the OLT;

generating an ONU Active Timeout Count table indexed by ONUID, which includes said Active Timeout Counter and reported flags to indicate whether MPCP messages have been reported by corresponding ONUs;

said step of determining in step A comprises: according to ONUID index, reading out ONU status information from the ONU Status Information table one by one, determining whether current ONU is invalid according to said ONU status information;

said step of determining in step B comprises: reading out table item of said current ONU from Active Timeout Count table, determining whether there exists a reported flag in corresponding table item of said current ONU, if yes, it can be concluded that MPCP messages have been reported in the present bandwidth allocation polling period; otherwise, it can be concluded that MPCP messages have not been reported;

between step C and step D, further comprising: clearing the reported flag of said current ONU in the ONU Active Timeout Count table;

said step of determining in step D comprising: determining whether all table items of the ONU Status Information table are read out, if yes, it can be concluded that all the ONUs have been inquired; otherwise, it can be concluded that some of the ONUs have not been inquired.

4. The method according to Claim 1, further comprising:

generating a vMAC Granting information table indexed by ONUID, which includes granting information of each of the service ports of the ONUs and granted flags to indicate whether corresponding service ports are authorized;

the step of recording granting information in step b) comprises: recording said granting information in the vMAC Granting information table, setting granted flag of said granted service ports as authorized;

the step of reading out granting information in step c) comprises: searching for table items corresponding to the service ports of the same ONU in the vMAC Granting information table according to ONUID index, searching for granted service ports according to granted flag, reading out granting information of the granted service ports; and

after step d) further comprising: setting the granted flag as negative of the service ports which have read out granting information.

5. The method according to Claim 1, further comprising:

generating the ONU Status Information table indexed by ONUID, which is to store status information of every ONU that is generated according to MPCP messages communication between the ONUs and the OLT;

before step c) further comprising: reading out status information of the ONUs one by one from the ONU Status Information table according to ONUID index, determining whether current ONU status is invalid according to the status information of said current ONU, if yes, returning to read a next ONU status information in the ONU Status Information table, otherwise, proceeding to step c).

6. The method according to Claim 1, wherein said services being classified by priority in descending sequence in step a) as fast forwarding service, automatic detecting MPCP message service, non-automatic detecting MPCP message service, MF service, Assured Forwarding service and Best-Effort Forwarding service.

7. The method according to Claim 6, wherein as to services except automatic detecting MPCP message service, said step of authorization in step b) comprises:

b11) confirming current to-be-granted service port according to uplink service activating status;

b12) according to the residual bandwidth resource in the current bandwidth allocation polling period, determining whether current bandwidth resource is available to the constant amount of data of said current to-be granted service port for non-automatic detecting MPCP message service, or to the report information from said

current to-be-granted service port for the other types of the services, if yes, proceeding to step b13); otherwise, proceeding to step b15);

b13) authorizing said current to-be-granted service port to transmit service data, and recording the current granting information;

b14) updating residual bandwidth in the current bandwidth allocation polling period and relevant information of said current to-be-granted service port; and

b15) determining whether there are un-granted service ports of current priority service, if yes, returning to step b11); otherwise, authorizing the ports of the next priority service.

8. The method according to Claim 7, further comprising:

generating a Service Active ONU Bitmap register for every type of service to store active information indicating whether the type of service is activated in the ONUs;

generating a Service Active Port Bitmap table for services with port as unit, which is indexed by ONUID, to store active information indicating whether this type of service is activated in the accessed service ports of the ONUs;

generating a vMAC Report Information table indexed by ONUID, to store report information from the accessed ports of the ONUs;

step b11) comprises: polling the Service Active ONU Bitmap register and the Service Active Port Bitmap table of every service type in descending sequence of priorities, finding out a service port with positive active information and confirming the service port as said current to-be-granted service port;

before step b12) further comprising: finding out report information of current to-be-granted service port from the vMAC Report Information table; and

in step b15), determining whether there are unread table items in current Service Active ONU Bitmap register and current Service Active Port Bitmap table, if yes, returning to step b11); otherwise, inquiring the corresponding Service Active ONU Bitmap register and Service Active Port Bitmap table of the service with the next priority.

9. The method according to Claim 7 or 8, wherein

for the fast forwarding service, said granting information comprising start time of data transmission and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the fast forwarding service, said step of scheduling granted start time in step d) comprising: taking said start time of data transmission of said granting information as the granted start time of data transmission;

for the non-automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE and REGISTER&GATE; said report information comprising MPCP message type field and reserved field;

for the MF service, said granting information comprising reserved field and sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted;

for the Assured Forwarding service, said granting information comprising grant deficit quantity and sizes of data transmission of corresponding service ports; said report information comprising reported sizes of data waiting to be transmitted;

for the Best-Effort Forwarding service, said granting information comprising sizes of data transmission; said report information comprising reported sizes of data waiting to be transmitted.

10. The method according to Claim 7, further comprising:

generating a Bandwidth Information table for those service ports requesting bandwidth control, to store transmit quantum in every bandwidth allocation polling period;

the step of determining for those service ports requesting bandwidth control in step b12) comprises: finding out transmit quantum of current service port from the Bandwidth Information table, determining whether current bandwidth resource is available according to report information from said current to-be-granted service port,

transmit quantum of said current to-be-granted service port and said residual bandwidth resource in the current bandwidth allocation polling period.

11. The method according to Claim 6, further comprising generating a start-up counter for the automatic detecting MPCP message service;

the step of authorizing service ports in step b) comprises:

b21) touching off said start-up counter, when said counter achieves configured threshold, launching the process of the automatic detecting MPCP messages detecting, if a automatic detecting MPCP message is detected, proceeding to step b22); otherwise, resetting the start-up counter and returning to step b21);

b22) determining whether current bandwidth resource is available to the constant amount of data of said current to-be-granted service port, according to the residual bandwidth resource in current bandwidth allocation polling period of the automatic detecting MPCP message service, if yes, entering step b23), otherwise, authorizing the ports of the next priority service;

b23) resetting the start-up counter and returning to step b21).

12. The method according to Claim 11, wherein

for the automatic detecting MPCP message service, said granting information comprising downlink MPCP message type and reserved field, wherein said MPCP message type comprising Discovery GATE, Normal GATE, REGISTER&GATE.

13. The method according to Claim 1, after step d) further comprising: determining whether there is still any ONU with un-granted port, if yes, returning to step c); otherwise, ending.

14. The method according to Claim 1, wherein the type of said downlink granting messages of the method is GATE downlink MPCP message.

15. The method according to Claim 7, 8 or 10 wherein said uplink granting information of the present method being carried by REPORT messages.

16. The method according to any one of Claim 2, 7 and 10, wherein said bandwidth allocation polling period of the present method is the virtual frame period.